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STATE OF WEST VIRGINIA.

REPORT

MADE TO THE

BOARD OF PUBLIC WORKS,

ON

PRELIMINARY SURVEYS,

UNDER THE

ACT OF FEBRUARY 25, 1871.

CHARLESTON:
HENRY S. WALKER, PUBLIC PRINTER.
1872.

STATE OF WEST VIRGINIA,
EXECUTIVE DEPARTMENT,
February 20, 1872.

Gentlemen of the Senate and House of Delegates:

I have the honor to submit the report of Major A. H. Campbell, who was appointed by the Board of Public Works, as chief engineer, to make a preliminary survey of a railroad route from Charleston to the Pennsylvania line.

I submit this report in manuscript, because it could not be printed before the Legislature will adjourn.

Very respectfully,
JOHN J. JACOB.

REPORT.

CHARLESTON, Feb. 12th, 1872.

HON. J. J. JACOB,

I have the honor to make the following report upon the surveys entrusted to my charge, under the provisions of the act of February 25, 1871. It was intended to have submitted a report on the completion of the surveys last fall, which from the want of means to perfect, would have been simply a report of progress; but having received information that a company had been organized at Clarksburg, October 31, last, under the act of February 28, 1871, and that they would furnish me with means to complete, at least the estimate of cost of the road, so far as the survey was made for that purpose, I have delayed, by tacit consent, to present this report until the present time.

The act requires that the engineer shall survey and select the most eligible and practicable route for the construction of a railroad "from Charleston to the Pennsylvania State line," and that he "shall be required to survey and report upon the several routes heretofore contemplated between said points," and that his report shall give a "full and accurate description of the route deemed most eligible by him, the timber, coal and other articles of wealth along such route, the probable cost," &c., &c.

As far as could be ascertained there were but two general routes contemplated between the Elk and the West Fork of the Monongahela rivers. One up the Elk to near Braxton Court House, and thence across to Weston; and the other diverging up the Big Sandy, twenty-one miles above Charleston, via West Fork of Little Kanawha, mouth of Steer creek, Little Kanawha via Glenville or Leading creek to Weston.

Having completed the organization of a party with the requisite instruments, camp equipage, &c., the survey was commenced on the sixteenth of May last, at Charleston, at a point near the suspension Bridge, and was conducted up the Valley of the Elk on the North, or right bank.

The distance from the mouth of Big Sandy to Weston, by the contemplated route, is about one hundred miles; the distance from Charleston to the Pennsylvania line is about two hundred miles; the total distance to be surveyed was therefore about three hundred miles, and for this purpose the sum of only $4,000 was appropriated—a sum totally inadequate to perform the service contemplated by the act. Under this disadvantage the surveys were commenced with the hope that adventitious aid would be afforded to complete them from other sources. In this hope, however, we were disappointed, except in the prompt and generous aid of the board of supervisors of Kanawha county, who appropriated $1,000 toward the surveys.

The question of choice of routes was left until the survey reached the Big Sandy, from which point an examination into the feasibility of the two routes could be made under the circumstances; and the decision, after careful consideration and examination, was made in favor of continuing up the Elk, and was based entirely on the comparative economy of the undertakings. It was found that transportation of party and camp equipments could be effected up Elk with very little cost, while on the Sandy route an expensive team would have to be retained to move camp from time to time, and draw supplies, in the main, from Charleston ; and furthermore, being satisfied that the appropriation was too small to secure the results anticipated, I was desirous of eking it out to the fullest extent, and to at least reach the West Fork of Monongahela *at some point*. For these reasons the survey was continued up Elk, a few miles being run up Sandy pending the decision of routes.

The season was peculiarly favorable for the prosecution of the survey and the party made satisfactory progress, considering the extreme heat of the summer, the wilderness character of the country and the amount of cutting necessary to clear the line. The route continued up the Elk as far as the mouth of Little Otter creek, a distance of about ninety-three miles. The ground passed over, except in point of curvature, which is great, is exceedingly favorable for the construction of a railroad, the graduation being comparatively light and the grades remarkably low, there being no grades necessary to exceed sixteen feet per mile. The Valley of the Elk is narrow and tortuouss particularly above Sandy. The banks of the river along the bottom, vary from thirty to forty feet in height above low water, and are permanent. The grade of the road was fixed for the most part near the height of the great freshet of 1861, but was not confined strictly to that height, for in some instances it is both a few feet above and below it. It is established, however, safely above all other high water lines, except this unusual and extraordinary one of 1861. In many of the "narrows," as they are termed, where the mountains slope to the river, nature seems to have anticipated the construction of a railroad, by providing a *bench* of the proper height and width, with very little work remaining to prepare a road bed. In other and more precipitous narrows, sloping at an angle of about 45° and where no bench occurs, the *strata* lie favorably, requiring light excavation, and dipping in such a direction—away from the line—as to prevent slides from the slope of the mountains.

There are but one or more points as far as the mouth of little Otter Creek, where there is much danger to be apprehended from slides; and it is believed that these points can be guarded against by a judicious location, avoiding excavations and the employment of rip raps or retaining walls. There is perhaps no equal distance within the limits of the State where a lighter profile with similar grades can be obtained, than from the mouth of Elk River to Little Otter Creek. It is upon this portion of the line that a somewhat detailed estimate was made and hereinafter submitted.

It was the intention to run the line up Elk as far as Granny's Creek near Sutton, and thence by that creek from the river toward the West Fork of Monongahela at or near Weston. Not having been able to leave the party sufficiently long to make a reconnoisance of the country between Elk and the Little Kanawha, and it being the only route suggested by those most familiar with the country, I directed the continuance of the survey above Little Otter toward Sutton, while I made an examination of the Little Otter and Granny's Creek routes. The survey on Elk was terminated August 12, at station 5,022, a distance of about 95 miles, near Beall's mill, and some three or four miles below Sutton. This reconnoisance satisfied me that the Little Otter route promised more to the eye than the Granny's Creek route in point of distance at least, the other features being somewhat similar. The survey was accordingly turned up Little Otter Creek and run up the middle fork of that creek as far as the junction of Brushy and Walnut forks; thence up this latter fork to Young's Summit, dividing the waters of Elk from those of Little Kanawha, a distance of about three and a half miles from Elk; thence down the Road Fork of the Dutch Fork of Steer creek to Dutch Fork; thence up this Fork to Perkins' Summit dividing the waters of Steer and Cedar creeks, tributaries of Little Kanawha; thence down Steer creek to the middle fork of Cedar creek; thence down this stream to the Three Forks; thence up Westfall Fork of cedar Creek to Armentrout's Summit, dividing the waters of Cedar creek and Salt Lick creek, and thence down the right hand fork of Salt Lick creek to the main creek; thence down it to the Little Kanawha opposite the mouth of Oil creek, one hundred and twelve seventeen-hundreths miles; thence up Oil creek to the West Fork of the Monongahela about twelve miles by turnpike above Weston, at Duvall's, passing a Summit near the latter stream. The distance from the Suspension Bridge at Charleston to this latter point is one hundred and twenty-two and three-fourths miles. Having during the progress of the above survey from the mouth of Oil creek to Duvall's, examined a more direct route to Weston, I determined to run it in preference to returning to Elk by the Granny's creek route which I had hoped to do, but my object being to get a survey for grades and distance over the most direct and practicable route from Elk to Weston, I could not accomplish both projects for the want of means. At a point nearly three and a half miles from the mouth of Oil creek, I commenced a line running up Oil creek to the Three Lick Fork; thence up this stream to Quinn's Summit, between this creek and the Grass Fork of Indian Fork of Sand Fork of Little Kanawha; thence down Grass Fork and up Indian Fork to *Nolan's* Summit between Indian Fork and Crooked Fork of Sand Fork; thence down this stream and up Ellis' Fork of Crooked Fork to *School-house* Summit between Crooked Fork of Sand Fork and Rush Run, a tributary of the West Fork of the Monongahela river; thence down Rush Run to its *debouchement* at West Fork of Monongahela, the terminus of the survey; a point about two miles above Weston, and distant one hundred and twenty-nine ninety-five one hundreths miles from Charleston.

By the latter route from Elk to Weston, on the line as examined, there are six summits to be encountered, which will require tunnel work, with an average of 1,650 feet for each tunnel, (the longest being 1,800 feet, and the shortest 1,500 feet,) or about 9,900 feet in all. The maximum grade upon this line may not exceed seventy-five or eighty feet per mile. By the route to West Fork, at Duvall's, twelve miles above Weston, there will be required but three tunnels with an aggregate length of 4,700 feet, and these occur between Elk and Little Kanawha. Upon this route the maximum grade may not exceed 80 feet per mile. The above figures are derived from the profile of the hasty line run as above stated; but on a more careful examination of these lines, I am confident that the length of these tunnels can be reduced one half, the hill-sides affording eligible ground for a proper location. An alternate line was run from the junction of Road Fork and Dutch Fork of Steer creek over a high summit, and thence down what is called the Back Fork of Cedar creek, one of the three forks of that creek, connecting with the main line of survey at the mouth of Westfall creek. This line saves a little over a mile of distance, but will require a tunnel of at least one half mile, and a grade of seventy-five or eighty feet per mile.

The whole section between Elk and the West Fork requires a much more thorough examination than it was in my power to give it. It is believed that a shorter line, by at least one mile, can be made by taking up the Brushy Fork of Little Otter, or another stream unnamed nearer to Young's Summit, or the Right-hand Fork, and uniting with the main line on the Middle Fork of Cedar creek. Such a line would avoid Steer creek altogether, and throw out one tunnel at Perkins' Summit. It is also believed that the line from Little Kanawha to Weston via Rush run, can be located for the most part on the crest between Oil creek and the waters of Sand Fork, with a grade ascending from Oil creek, at the rate of about 80 or 84 feet per mile. Such a line would probably go up Poseys' Fork of Oil creek, thence to the head of Three Lick Fork, and reach the crest in the vicinity of the head of Indian Fork, east of *Quinn's* summit; thence by the crest to the head of Rush run. There are several lines of this kind that merit examination.

The county road occupies this ridge for several miles, and presents in many respects, a favorable location; such a location would throw out the three tunnels heretofore described.

The line proposed up Granny's creek via O'Bryan's Fork of Salt Lick creek, Buffington run, Big run, Fleshers' Fork of Nolls'. creek, and thence to Oil creek at Skinners, by the Clover Fork, merits a careful examination also. This line will require three or four tunnels. Granny's creek presents an unfavorable approach, and the line is believed to be longer than the Little Otter line; the grades will be about the same, and the character of the work generally identical. It should be borne in mind, that this section of the route, between Elk and the West Fork of the Monongahela, is probably, the most critical portion of the whole line; and it is to be regretted that the means were not ample enough to secure more definite results in regard to it. It is impossible, therefore, to advise as to the "most eligible route" for this portion of the road. Enough, however, has been done to determine the practicability of a railroad, and that no obstacles present themselves, which engineering skill cannot overcome with moderate cost. It would be hazardous to the reputation of any engineer to base a definite estimate upon such meagre data; but I am confident in my judgment, that the road from the mouth of Little Otter to Weston, by any line adopted with care, need not exceed $45,000 per mile; and much less if the tunnels are thrown out, or reduced in length and number, which I believe to be practicable.

It was not possible, under the circumstances in which I found myself, as to means for prosecuting this portion of the survey, with a view, even to an approximate estimate, to do more than run the line as fast as possible to obtain knowledge of the country, distances, and approximate grades; nor am I able to present a complete map of the entire survey. The line has been roughly platted on a scale of eight hundred feet to the inch, and the topography partially put on for ninety-three miles.

ROUTE UP BIG SANDY, VIA MOUTH OF STEER CREEK AND GLENVILLE, TO WESTON.

After completing the survey of the Elk line to near Weston, in pursuance of instructions, I returned to Charleston over what is termed the Big Sandy Route. I left Weston by the valley of Polk creek, passing a summit which will require a tunnel of about 1,000 feet, or by a higher grade with auxiliary power may be avoided; thence into Leading creek and down this as far as Miss Arnold's; thence over a divide to Stewart's creek. This divide will require a tunnel of about 1,800 feet; thence down Stewart's creek to the Little Kanawha; thence down this stream on its right bank to the mouth of Steer creek, crossing the Little Kanawha about one mile above the mouth of Steer creek; thence up Sycamore Fork of Steer creek to its left hand fork near Poling's house; thence up the left hand fork to a divide between it and Millstone creek, a tributary of the West Fork of Little Kanawha.

This divide will require a tunnel of about one thousand eight hundred or two thousand feet; thence down Millstone creek to the West Fork of Little Kanawha to its right Fork; thence up this Fork to White Oak run; thence up this run to a divide between it and Beech Fork of Henry's Fork of the West Fork of Little Kanawha. This divide will require a tunnel of about two thousand five hundred feet. From Beech Fork the route passes a divide between it and the upper Left Hand Fork of Big Sandy, which will require about three thousand feet of tunnelling; thence down Left Hand Fork to the Three Forks of Big Sandy, and thence down Big Sandy to its mouth, twenty-one miles from Charleston. The grades on this route will not exceed eighty feet per mile. The curvature on the Little Kanawha and its West Fork and the Big Sandy is, for the most part, strong. From Weston to the Sycamore Fork of Steer creek the route, (adopting the Leading creek route as the best and most direct, and avoiding the tunnel at the head of Stewart's creek) is identical with the one recommended by the engineers of the Washington and Ohio railroad, a distance of about fifty miles. The distance from Weston to the mouth of Big Sandy by this reconnoisance is, as near as could be estimated, one hundred miles, and from Charleston to Weston one hundred and twenty-one miles; a difference of eleven miles in its favor over the Elk route. Not having made an instrumental survey over this route for reasons already assigned, it would be impossible to make a fair comparison between them. It will be observed, however, that the grades on the Elk route to the mouth of Little Otter, ninety-three miles, are extremely light, and from there to the West Fork of Monongahela, thirty-seven miles, the maximum grade will not exceed seventy-five or eighty feet per mile, while on the other route the heavier grades will occur in at least an extent of sixty miles. The cost of the road on this route, from the mouth of Big Sandy to Weston, will be, in my judgment, about the same per mile as that from the mouth of Little Otter to Weston by the Elk route. By adopting a system of heavier grades, say eighty-four feet per mile, with the aid of auxiliary power, many, if not all, the tunnels may be avoided on this route.

It will of course be impossible for me to comply strictly with the letter of the act in giving my opinion as to the "most eligible" route of these two, for the want of sufficient data for a comparative estimate of cost and advantages. I will state, however, that, in my judgment, the Elk presents the greatest advantages in many respects: and first, because the grades for nearly one hundred miles are practically level; second, it traverses the finest portion of the bituminous coal fields of the State; and further, I believe it to be of cheaper construction.

MARYLAND LINE AND GREENBRIER SURVEY.

After having completed the reconnoisance of the Big Sandy route, in obedience to instructions, I proceeded to Piedmont, on the Baltimore and Ohio road, to make preparations for the survey of the route contemplated in the aforesaid act.

On consultation with the friends of that enterprise in regard to the character of the country to be traversed, and the means provided for the survey, I came to the conclusion that it would be a useless expenditure of the public money to attempt the survey without the remotest prospect of getting through to the southern terminus on the C. & O. railroad, in Greenbrier. Arrangements were made to make a reconnoisance of this route on horse-back, provided a suitable guide could be obtained, for the country on the head of Stony river, and thence to the Greenbrier, is described as a wilderness, for the most part, without roads, trails, or habitations. This arrangement failed, the guide recommended being unable to make the engagement. From all the information I could gather while at Piedmont, I became satisfied that the route is impracticable. The country at the head of Stony river was described to me verbally by Mr. Marbury, Engineer of the Washington and Ohio railroad surveys, while at Peidmont, and in a communication subsequently received from him, he says:

> "I have made several examinations of the country about the heads of Red creek and Stony river, and from my examinations I am well satisfied that the dividing ridge cannot be tunelled. From the head of Red creek, for a distance of three miles, the stream does not fall more than seventy feet per mile, and the Stony river side is equally flat. The east front of the Alleghany mountains is about 4,000 feet above tide at Alexandria, and the water in the Dry Fork of Cheat, at the mouth of Red creek, is 2,160 feet above tide at Alexandria. The distance is about fifteen miles from the head of Red creek to its mouth."

This statement would seem to settle the question of practicability, except at great cost and high grades. The proposed route for this survey is from the B. & O. railroad at Savage river; thence up the North Branch of the Potomac to Stony river; thence up Stony river to the summit of the Alleghany; thence down Red creek to Cheat river; thence up the Dry Fork of Cheat to its head; thence over the Alleghany to the valley of the Greenbrier, and thence down this stream to the C. & O. railroad, near the mouth of Howard's creek.

CHARACTERISTICS OF THE ELK ROUTE.

In reference to the coal, timber, and other articles of wealth along the route of this survey, I have to say briefly, that it was not possible to make a full examination of all the resources of the region traversed by the line of this road, for obvious reasons. Such notes, however, as could be, were incidentally taken, in progress of the survey, and in many instances the elevation and thickness of the coal seams cropping out adjoining, were noted. Coal abounds on the whole line from a point three or four miles above Charleston to the mouth of O'Bryan's creek, seventy-two miles. There is, probably, not a mile of land through this whole distance, bordering on the line of the survey on which a workable seam of coal may not be opened, and loaded into cars or boats by inclined planes, and in many instances, at grade height. On the north side of Elk, between Little and Big Sandy, no coal was observed, nor are there known to exist any openings in this distance, but it is believed to exist, for it abounds on the south side and there is a particularly rich vein of cannel coal, on Falling Rock creek, opposite Jordan's creek, and about eighteen miles from Charleston. Observations were taken on the coal in the vicinity of Cooper's creek, seven or eight miles from the mouth of Elk. It is in this vicinity, on both sides of the river, where the celebrated "Peacock" coal is found. This vein was found to be about 2½ feet thick, below Cooper's creek, and at Carson's, near the Salt Works of Chappel, eighteen feet below this, is a vein of good coal six feet thick, and twelve feet below this is another vein four feet thick. These veins alternately crop out as far as Little Sandy. There is a fine seam of coal three feet thick, nearly a mile above Big Sandy, and the same vein is supposed to be the one worked at Cobb's below Broad Run. What is there denominated the "Stockton" vein crops out at the river's edge opposite Queen Shoals creek; this vein is seven feet thick, and is supposed by some to be identical with the vein at Cannelton, on the Kanawha river. There is a vein of fine coal eight feet thick in the mountain at "Jack's Bend;" this vein is believed to be splint coal. The largest and most interesting out-crops observed are above and below Clay C. H., on both sides of the river. The "twin splint vein," as it has been called, seems to be the principle one, and if conjectures are correct a to its identity, at different points observed between Big Beechy creek and Wild Goose shoals, it varies from five to twelve feet in thickness. At Salisbury's or Leatherwood it was found to be five feet thick; at Pisgah creek, south side, twelve feet; at one and one-fourth miles below Clay C. H., eleven feet; and at Clay C. H., 11 feet, and opposite Big Buffalo, it is eleven feet thick. This seam is supposed to crop-out at the water's edge at Wild Goose Island and shoals. About forty-two feet above this vein is a seam of cannel shale two feet thick, said to be rich in oil.

The several points at which the several veins have been opened along the banks of Elk above the mouth of Big Sandy are numerous, and there may be mentioned among the most prominent points, Wolf Island shoals, mouth of Porter's creek, on north and south side under "Black Flint Ledge;" on same side near Masten's, Birch Run, Little Sycamore and Big Sycamore, on both sides of the river; at Pierson's on the north side—Philadelphia creeks, Little Beechy and Big Beechy creeks, Camp creek, on both sides; Pisgah, on south side; at Salisbury's; below and at Clay C. H.; mouth of Buffalo; Wild Goose Island Shoals; Big Spread shoals; "Lamb Place;" Standing Rock creek; above Chapman's; Waggys, south side, at Groves' mill, under water and at O'Bryan's creek on north side. Besides these there are many intermediate openings either on the river or a short distance up the creeks and smaller streams. In a word, Elk river may be said to traverse for sixty or seventy miles as valuable a bituminous coal area as exists in the world. From the mouth of Queen Shoals creek to O'Bryan's creek the lands on both sides of the Elk river cover from three to seven veins of coal varying in thickness from two to twelve feet, all having their out crops near the water and the grade of the railroad, so that from nearly all points this material is easily accessible.

This great coal field rises gradually to the south east in the direction of Gauly river at a grade of from thirty to seventy feet per mile, keeping above the water level until it reaches near the top of the water shed between Elk and Gauley rivers, having an out-crop on the Gauley side of the dividing ridge between these rivers. Here Gauley, though geographically from five to eight hundred feet higher than Elk, has cut its way down through this great coal deposit from eight hundred to one thousand feet deeper than the Elk basin, thus exposing the out-crops of many veins which lie beneath the water level of Elk and its tributaries. The dip of the stratification of this coal deposit being from Gauley toward Elk and the water shed being much nearer to Gauley than to Elk, most of the land between these two rivers is drained by streams flowing into the latter river heading ten or twelve miles back. These streams also cut deep into the coal deposits from their sources to their mouths, keeping on the same general grade of their stratification, thus exposing the same seams of coal nearly throughout their whole course, which are found to have their out-crops on Elk river; so that it will be observed that the whole region drained by these southern tributaries of Elk is workable, being accessible on all sides.

On the North-west side of Elk, the general dip of the strata being in that direction, the area of coal is not so great above the water level of Elk.

The quality of the coal in the Elk fields is very superior, being of the pure splint, splinty bituminous and other intermediate varieties, with traces of cannel and cannel shale, rich in oil. Pure cannel above Queen shoals was not observed, but it is believed that it will be found to exist in this region. Good coal exists, but not so abundant, nor in so great variety, between Elk, in Braxton county, and Weston. A vein of five feet has recently been discovered on Little Otter creek, on the lands of the Little Otter Salt Company. This coal field seems to be drained by Cedar creek, and crops out on Little Kanawha, as low down as Glenville, or vicinity. There seem to be two seams of coal in this region, one of four or five feet, and the other six or eight feet in thickness, and over a hundred feet apart; the lower seam is represented to be of an excellent quality, entirely free from sulphur and highly bituminous; it seems to partake of the character of splint coal.

As a smelting agent, in its "raw" state, it is believed the Elk river splint coal has no equal. It and other coals abound in vast quantities and of itself, alone, will in time, afford all the traffic a railroad can manage.

TIMBER.—As a timber region, Elk river and its tributaries,have probably no equal on the continent, for the kinds of wood that abound, and this is true of the entire region traversed by this road from Big Sandy to Weston, on all routes. Among the hard woods, white oak predominates; on the tops of the ridges, rock oak abounds; sugar maple and hickory are also common; walnut, white and black, chestnut linn, ash and poplar, also abound. White oak, poplar and chestnut are the most abundant kinds generally distributed; beech is also plentiful, and less valuable trees, such as black birch, buckeye, black and sweet gum, and in some localities hemlock.

IRON ORE.—This ore is said to be abundant throughout the entire route of the survey. It is to be seen scattered more or less over the whole country, but I believe it has been rarely found in sufficiently large quantities to make it profitable to mine or collect it under present conditions. I am satisfied, however, that much of this valuable ore does exist, and when roads and railroads, and other improvements, are made throughout the land, it will be profitable to have it collected and concentrated upon the line of the railroad for shipment. Very many beds of it, in some of its varieties, are said to exist on Cedar creek and its tributaries. Indications of iron are met with almost everywhere; the shoals of Elk contain large quantities of it.

SALT.—Salt water of superior quality is found along the line of this survey, between Elk and the Little Kanawha rivers, in Braxton county, These facts are too well known to require more than a brief notice.

SOIL.—Richness of soil is proverbial of West Virginia in nearly every section of the State. Along the line of this road it is good nearly every where; even on some of the steeper slopes along the Valley of the Elk; but there is perhaps no section of mountain lands in the State that will surpass in the elements of fertility the whole region from the Elk to the West Fork of the Monongahela, and particularly that portion of this section drained by the head streams of Steer and Cedar creeks.

Time nor opportunity permit an estimate of the probable business to be done by a railroad through the section of the State through which it is contemplated to build the road for which this survey was made. The mountains are full of every variety of bituminous coals. They abound in almost every variety of valuable timber, except the pines. Iron ore, hydraulic lime, and salt abound in some localities, and the soil generally is of great fertility, capable of yielding the varied products of agriculture common to the Middle States. Stock raising is now, and must in future continue to be, one of the most impor-